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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/660,410	09/10/2003	Erik Lier	040092-020110US	5827

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EXAMINER

MULL, FRED H

ART UNIT	PAPER NUMBER
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3662

DATE MAILED: 03/07/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/660,410

Applicant(s)

LIER ET AL.

Examiner

Fred H. Mull

Art Unit

3662

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12 January 2004 and 19 January 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-59 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-10, 12-14, 20-21, 27-27, 39-41, 47-48, and 54-59 is/are rejected.
- 7) ☒ Claim(s) 11, 15-19, 22-26, 38, 42-46 and 49-53 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 01/12/2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 09/10/2003.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Information Disclosure Statement

1. The listing of references in the specification is not a proper information disclosure statement. 37 CFR 1.98(b) requires a list of all patents, publications, or other information submitted for consideration by the Office, and MPEP § 609 A(1) states, "the list may not be incorporated into the specification but must be submitted in a separate paper." Therefore, unless the references have been cited by the examiner on form PTO-892, they have not been considered.

Claim Objections

2. Claim(s) 1-59 is/are objected to under 37 CFR 1.75. The claim(s) recites the limitation "interleaved". However, this term is not clearly defined. According to Hargrave's Communications Dictionary, the term is defined as: "The arrangement of one sequence of items with another sequence of similar items in an alternating manner.". However, the array illustrated in applicant's Fig. 2 does not alternate one antenna element and then one probe and then one element and then one probe, etc. Since the definition of this term is unclear, the breadth of the claims is unclear. Correction is required.

3. Claims 31-32 and 58-59 are objected to under 37 CFR 1.75. Claims 31 and 58 state: "The antenna system as recited in claim ..., wherein the redundant calibration system is the same as the calibration system." However, if the "redundant calibration

system" is the same system as the "calibration system", then there is only one system, and hence, no redundancy. The examiner suggests rewording the claim to indicate something like the redundant system is separate but operates in the same manner of the calibration system. The meaning of claims 32 and 59 is unclear.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 1-10, 12-14, 20-21, 27, 33-37, 39-41, 47-48, and 54 are rejected under 35 U.S.C. 102(b) as being anticipated by Ashe.

In regard to claim 1, Ashe discloses a plurality of antenna elements (11, Fig. 1); and an antenna beamforming system (col. 4, lines 44 to col. 5, line 6); a calibration system (20) adapted to calibrate the antenna array in either a transmit mode or a receive mode (col. 3, lines 5-12), the calibration system comprising: a plurality of calibration probes interleaved with the plurality of antenna elements (col. 3, lines 55-65; col. 5, lines 22-28), the calibration probes adapted to be transmit calibration probes or receive calibration probes (col. 3, lines 55-65; col. 5, lines 22-28); a calibration

processing system adapted to calibrate the antenna array utilizing the interleaved calibration probes (col. 7, lines 42-46).

In regard to claims 6 and 33, Ashe discloses a plurality of antenna elements (11, Fig. 1); and an antenna beamforming system (col. 4, lines 44 to col. 5, line 6); a calibration system (20) adapted to calibrate the antenna array in either a transmit mode or a receive mode (col. 3, lines 5-12), the calibration system comprising: a plurality of calibration probes interleaved with the plurality of antenna elements (col. 3, lines 55-65; col. 5, lines 22-28), the calibration probes adapted to be transmit calibration probes or receive calibration probes (col. 3, lines 55-65; col. 5, lines 22-28); a calibration tone signal generator adapted to generate a calibration tone, wherein the calibration tone is input to the antenna array when the antenna array is in transmit mode, and wherein the calibration tone is input to the plurality of calibration probes when the antenna array is in the receive mode (col. 3, lines 29-30); an encoding signal generator adapted to generate sets of encoding signal values, and wherein the sets of encoding signal values are input to the antenna array, and the antenna array encodes the calibration tone signal traversing the antenna array with the sets of encoding signal values, generating encoded calibration signals (col. 3, lines 28, 32-33); and a signal decoding and processing system adapted to decode and process the encoded calibration signals to produce calibration data for the antenna array (col. 3, line 40). The system may be on a satellite (col. 3, lines 19-23).

In regard to claim 2, Ashe further discloses the calibration processing system calibrates the antenna array by performing control circuit encoding (CCE) calibration on the array (col. 3, lines 24-42, particularly line 42).

In regard to claims 7, 34, Ashe further discloses each set of encoding signal values are orthogonal to other sets of encoding signal values (col. 3, line 30).

In regard to claims 12, 20, 39, 47, Ashe further discloses the antenna array is operating in transmit mode, and wherein the antenna system is adapted such that: the antenna array receives the calibration tone signal from the calibration tone signal generator, encodes the calibration tone signal with the sets of encoding signal values, generating the encoded calibration signals, and transmits the encoded calibration signals; one or more of the calibration probes receive the encoded calibration signals and transmit the signals to the signal decoding and processing system; and the signal decoding and processing system produces the calibration data for the antenna array (col. 3, line 24-41; col. 4, lines 44 to col. 5, line 34).

In regard to claims 3, 8, 13, 21, 25, 40, 48 Ashe further discloses the antenna beamforming system is adapted to generate one or more beams, and wherein the beamforming system comprises an RF signal path to each element of the antenna array for each of the one or more beams and wherein the calibration system is adapted to calibrate each of the RF signal paths (col. 4, lines 22-61).

In regard to claims 4, 9, 36, Ashe further discloses each signal path comprises a phase shifter, and wherein the calibration system calibrates the phase shifters (col. 4, lines 44-49).

In regard to claims 5, 10, 37 Ashe further discloses each signal path comprises an attenuator, and wherein the calibration system calibrates the attenuators (col. 4, lines 44-49).

In regard to claims 14, 41 Ashe further discloses each of the antenna elements of the antenna array are radiatively coupled with a plurality of calibration probes, so that each signal path will have a plurality of encoded calibration signals associated with it. (col. 3, lines 55-65).

5. Claims 1 and 3-5 are rejected under 35 U.S.C. 102(b) as being anticipated by IDS reference Hirshfield.

In regard to claim 1, Hirshfield discloses a plurality of antenna elements (12, Fig. 1A); and an antenna beamforming system (10; col. 3, lines 15-17); a calibration system (22; col. 3, lines 22-23) adapted to calibrate the antenna array in either a transmit mode or a receive mode (col. 3, lines 29-30), the calibration system comprising: a plurality of calibration probes interleaved with the plurality of antenna elements (col. 3, lines 20-28), the calibration probes adapted to be transmit calibration probes or receive calibration probes (col. 5, lines 50-55; col. 6, lines 25-28); a calibration processing system adapted to calibrate the antenna array utilizing the interleaved calibration probes (col. 5, line 56 to col. 6, line 32).

In regard to claim 3, Hirshfield further discloses the antenna beamforming system is adapted to generate one or more beams, and wherein the beamforming system comprises an RF signal path to each element of the antenna array for each of the one

or more beams and wherein the calibration system is adapted to calibrate each of the RF signal paths (Figs. 1A-1B; col. 2, lines 50-52; col. 5, lines 13-49).

In regard to claim 4, Hirshfield further discloses each signal path comprises a phase shifter, and wherein the calibration system calibrates the phase shifters (Figs. 1A-1B; col. 2, lines 50-52; col. 5, lines 13-49).

In regard to claim 5, Hirshfield further discloses each signal path comprises an attenuator, and wherein the calibration system calibrates the attenuators (Figs. 1A-1B; col. 2, lines 50-52; col. 5, lines 13-49).

6. Claims 1 and 3-5 are rejected under 35 U.S.C. 102(b) as being anticipated by Miller.

In regard to claim 1, Miller discloses a plurality of antenna elements (A_1 - A_N , Fig. 1); and an antenna beamforming system (12); a calibration system (col. 8, line 46 to col. 9, line 17) adapted to calibrate the antenna array in either a transmit mode or a receive mode (col. 10, lines 21-27), the calibration system comprising: a plurality of calibration probes (A_1 , A_{10} , A_{N-8}) interleaved with the plurality of antenna elements (Figs. 1 and 2), the calibration probes adapted to be transmit calibration probes or receive calibration probes (col. 10, lines 21-27); a calibration processing system adapted to calibrate the antenna array utilizing the interleaved calibration probes (col. 14, lines 24-28).

In regard to claim 3, Miller further discloses the antenna beamforming system is adapted to generate one or more beams, and wherein the beamforming system comprises an RF signal path to each element of the antenna array for each of the one

Art Unit: 3662

or more beams and wherein the calibration system is adapted to calibrate each of the RF signal paths (Fig. 1; col. 9, lines 17-47).

In regard to claim 4, Miller further discloses each signal path comprises a phase shifter, and wherein the calibration system calibrates the phase shifters (col. 9, lines 27-32).

In regard to claim 5, Miller further discloses each signal path comprises an attenuator, and wherein the calibration system calibrates the attenuators (col. 9, lines 27-32).

7. Claims 1 and 3-5 are rejected under 35 U.S.C. 102(b) as being anticipated by Geyh.

In regard to claim 1, Geyh discloses a plurality of antenna elements (000-105, Fig. 2); and an antenna beamforming system (140, Fig. 1); a calibration system (110) adapted to calibrate the antenna array in either a transmit mode or a receive mode (col. 2, lines 14-19); the calibration system comprising: a plurality of calibration probes interleaved with the plurality of antenna elements (043; col. 3, lines 35-48), the calibration probes adapted to be transmit calibration probes or receive calibration probes (col. 2, lines 14-19); a calibration processing system adapted to calibrate the antenna array utilizing the interleaved calibration probes (col. 8, lines 3-12).

In regard to claim 3, Geyh further discloses the antenna beamforming system is adapted to generate one or more beams, and wherein the beamforming system comprises an RF signal path to each element of the antenna array for each of the one

Art Unit: 3662

or more beams and wherein the calibration system is adapted to calibrate each of the RF signal paths (col. 4, lines 10-17).

In regard to claim 4, Geyh further discloses each signal path comprises a phase shifter, and wherein the calibration system calibrates the phase shifters (col. 2, lines 27-36; col. 4, lines 27-33).

In regard to claim 5, Geyh further discloses each signal path comprises an attenuator, and wherein the calibration system calibrates the attenuators (col. 2, lines 27-36; col. 4, lines 27-33).

8. Claims 1 and 3 are rejected under 35 U.S.C. 102(e) as being anticipated by Gottl.

In regard to claim 3, Gottl discloses a plurality of antenna elements (3, Figs. 1 and 6); and an antenna beamforming system (17; ¶ 43, lines 1-3); a calibration system (¶ 16, lines 1-4) adapted to calibrate the antenna array in either a transmit mode or a receive mode (¶ 1), the calibration system comprising: a plurality of calibration probes (11, 111) interleaved with the plurality of antenna elements (right below and between and below (11c, 11d) elements in Fig. 1; between (next to 25") and outside (next to 25") of groups of elements in Fig. 6), the calibration probes adapted to be transmit calibration probes or receive calibration probes (¶ 1); a calibration processing system adapted to calibrate the antenna array utilizing the interleaved calibration probes (¶ 23, 52).

In regard to claim 3, Gottl further discloses the antenna beamforming system is adapted to generate one or more beams, and wherein the beamforming system

Art Unit: 3662

comprises an RF signal path to each element of the antenna array for each of the one or more beams and wherein the calibration system is adapted to calibrate each of the RF signal paths (§ 22, lines 5-8; § 28, lines 11-22).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. Claim 27, 30-32, 54, and 57-59 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ashe.

In regard to claims 27 and 54, helical antenna elements, microstrip antenna elements, horn antenna elements, and dipole antenna elements are all well known types of antenna elements.

In regard to claims 30-32 and 57-59, it would have been obvious that multiple calibration probes allows calibration to be done when some calibration probes are not working, thus providing calibration redundancy.

Art Unit: 3662

10. Claim 28-32 and 55-59 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ashe, as applied to claim 6, and in further view of Miller.

In regard to claims 28-29 and 55-56, Ashe discloses a series of elements, some of which can be used to calibrate the others. Ashe fails to disclose those elements being arranged in multiple arrays.

Miller discloses series of elements, some of which can be used to calibrate the others. Miller discloses those elements can being arranged in multiple arrays (Fig. 2)

It would have been obvious to use the elements of Ashe in multiple arrays in order to allow two-dimensional steering of the antenna beam.

In regard to claims 30-32 and 57-59, it would have been obvious that multiple arrays allows calibration to be done with some of the array when some calibration probes are not working, thus providing calibration redundancy.

11. The examiner also finds the following reference(s) relevant:

Boe, in which each antenna element in turn acts as a transmit or receive probe for the other elements.

Lier '296, Lier '545, Lier (NPL), Silverstein '219 and Silverstein (NPL) which discusses the use of a calibration tone signal generator, an encoding signal generator, and a signal decoding and processing system.

Applicant is encouraged to consider these documents in formulating their response (if one is required) to this action, in order to expedite prosecution of this application.

Allowable Subject Matter

12. Claim(s) 11, 15-19, 22-26, 38, 42-46, and 49-53 would be allowable if rewritten to overcome the objection(s) set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Fred H. Mull whose telephone number is 703-305-1250. The examiner can normally be reached on M-F 9:00 - 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Thomas H. Tarcza can be reached on 703-360-4171. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Effective approximately April 5, 2005, the following new telephone numbers will be in effect: Fred H. Mull: 571-272-6975, Thomas H. Tarcza: 571-272-6979.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Art Unit: 3662

Fred H. Mull

Examiner

Art Unit 3662

fhm

A handwritten signature in black ink, reading "Thomas H. Tarcza". The signature is written in a cursive, flowing style with a large initial 'T'.

THOMAS H. TARCZA
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 3600